Development of Novel Distribution Automation System (DAS) on Customer Side Distribution System

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Abstract--**This research work has been done in designing and developing a Novel Distribution Automation System (DAS) in an open loop customer side distribution system. The research has utilized an automation techniques in both hardware and software environment using a communication network and embedded controllers along with power meters which has utilized the possible best solution for the fault operation and control tasks remotely. All hardware and software components have been developed and integrated together. Data exchange mechanism has been developed between the host computer and the embedded controllers that function in two way data exchanges between the two. The remote hardware controllers such as remoter terminal units (RTUs) are enabled to the communication modules to operate the substation remotely. The metering equipment is used as real time data restoration tool and gathers the customer's consumption energy information. Thus a multipurpose power meter is used as hand of the electrical utility at the customer side. IsaGraf provides communication – GSM (Global system for Mobile Communications) function blocks such as SMS (Short Message Service) "operating functions "SMS_send", "SMS_test", "SMS_gets" and developed "SMS usage functions. These are functions are created for GSM based messaging system to communicate with the person in charge to operate the system at anytime and anywhere remotely. Fabrication testing has been done on real distribution system and the results are shown in this paper.**

Index Terms—**DAS**, **GSM, Open loop distribution, Ladder Logic, RTU, ELCB, Operation Time, Substation, MCCB (Molded Case Circuit Breaker).**

I. INTRODUCTION

THIS paper explains a research work which was done to develop novel DAS research project. Automatic meter reading (AMR) is one of the elements which has been done in this project. One of the aims was to make AMR as part of the DAS system in order to measure the power consumption using the developed DAS. The data from the meters connected to the consumers were accessed, read and captured at the customers' houses to a remote central location using communication
media without a direct visit. The traditional manual method uses handheld meter reader to collect meter readings from the meter where the meter reader has to walk by the locations where meters are installed. However, this is inefficient and unproductive because the recorded values on the handheld needs to be downloaded manually to the central billing system. AMR system can automatically read the meters and download the reading to the main control center. AMR can reduce meter reading and billing costs, prevent omission of consumption data, helps to study and analysis of consumption data, and provide data for enhanced distribution system management.

Tenaga Nasional Berhad (TNB), Malaysia's largest electricity utility has announced a contract with Itron Inc., USA, in June 2007 to deploy the AMR meters utilizing GSM as the communication network. The other technology being widely tested in the other countries is radio frequency technology utilizing handheld, mobile, or fixed networks [2].

Currently there is a lot of active research being carried out in the field of remote metering system.

[3] Describes the development, design and implementation of a remote meter monitoring system using a camera and wireless ZigBee nodes. The major hardware components of this design are a Logitech Quickcam webcam and a pair of Integration ZigBee USB dongles. The system is a one-click application that will capture a picture of the meter and wirelessly transmit to the ZigBee nodes from up to 10m away. The device with the camera initializes the ZigBee network and waits on standby until a reader connects. Upon a connection, the camera device transmits an image of the meter to the handheld reader. The handheld reader then displays the image on its screen.

[4] Introduces new modeling and simulation results from different configurations and techniques of automatic energy meter reading and management systems using mobile agents. The results are compared to traditional client server techniques. A mobile agent is a program that can autonomously migrate from host to host in a network of heterogeneous computer systems and fulfill a task specified by its owner.

[5] Proposes the application of ZigBee wireless technology and GPRS remote meter reading system. The system uses ZigBee technology access to data from local, long-distance transmission via GPRS, detailed analysis of the structure of the system and related technology to achieve and to expand the system to become Pervasive Computing examples of the idea. "Fig. 1" shows the three power system components whereby this research were focused on the low voltage distribution side (415/240 V).

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